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SWIM FLIPPER

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[Abstract]

A swim flipper comprising a slipper 1 and fin 2 that has central propelling surface 2a and two lateral ribs 2b, characterized by the fact that it has, in front of said slipper 1, slot 4 partially separating the slipper from said fin, said slot 4 extending from one edge to the other of propelling surface 2a of fin 2, which is attached to slipper 1 only by lateral ribs 2b.

The present invention relates to a swim flipper of the type intended to be worn on the feet of swimmers or divers, particularly for the purpose of facilitating swimming and increasing the speed of movement.

Conventional swim flippers ordinarily have a slipper intended for housing the foot and a fin starting from the ankle and extending the foot outwards, said fin generally having, on its two sides, at least two lateral ribs which give it a certain stiffness, making it possible to channel, in the direction of the trailing edge or free end of the fin, the stream or streams of water generated by the swimmer kicking their legs, and ensuring the

propulsion. The hydrodynamic performance of such flippers is mainly a function of the length of their fin, the value of the propulsive effect increasing with increase of the length of this fin.

In theory, it would therefore be sufficient to lengthen the fin indefinitely in order to obtain a flipper with a very high performance or propulsive effect, and this theory has therefore led the majority of manufacturers to increase the length of their flippers more and more. However, from the practical standpoint, this theory comes up against the fact that the longer the fin of a flipper, the higher the energy expenditure required for its movement in the water, while lengthening of the fin cannot exceed a threshold beyond which the muscular capacity and the energy reserve of the user are incompatible with the effort required to kick the flippers. It is therefore seen that the search for improvement of the performance of the swim flippers by increasing the length of their fin results in a dead end, the results obtained by such an increase not enabling one to generalize this solution to the most common areas of application of said flippers. In the ordinary applications (leisure or professional activities), the users therefore prefer to use conventional flippers with a relatively reduced length (for example, on the order of 60 cm) and a very average performance. There are mainly three causes for the mediocre hydrodynamic performance of the traditional flippers:

-1) their fin has a certain permanent longitudinal stiffness, particularly in the portion in the immediate extension of the slipper and corresponding to a little more than a third of said fin; this lack of flexibility being a cause of the fin's delay in assuming a curvature favorable for propulsion, at the beginning of the first kicking period or forward movement of the leg that is the most effective of the two movements and plays a predominant role in the propulsion, while this curvature remains insufficiently pronounced at the site of said portion; this results in the creation of a negative zone in front of this portion, designated by the reference N in Figure 10, that causes a braking effect obliging the swimmer to make a great effort;

-2) their fin is generally arranged in the extension and in the plane of the sole of the slipper, or forms with the latter an angle of only a few degrees, so that it also forms, with the leg, a relatively large angle α (Figure 10) at the start of the first kicking period; consequently, at the beginning of the forward movement of the leg, the fin occupies a position that is not very favorable for the effectiveness of this movement and for propulsion;

-3) their fin has a certain permanent transverse stiffness, more particularly in its half situated in the immediate extension of the slipper; consequently, during kicking movements, the fin remains flat or roughly flat, at least in said half, which promotes

lateral escape of water (Figure 12) and does not enable one to obtain an optimal propulsive effect from the volumes or streams of water moved during kicking.

In conclusion, the above-mentioned imperfections of the traditional flippers are causes of fatigue for the users and limitation of their performance.

The present invention in particular aims to remedy the disadvantages or insufficiencies of the conventional swim flippers emphasized in the preceding.

According to the invention, this objective is attained by means of a flipper which is in particular remarkable in that it has, in front of the slipper, a slot that advantageously has the form of a curved notch, and that partially separates the slipper from the fin.

According to another characteristic arrangement of the invention, the fin of the flipper forms a negative dihedral angle, and preferably a negative dihedral angle of 30° or on the order of 30°, with respect to the plane that includes the sole of the slipper of said flipper.

The invention provides several very valuable advantages. One of these advantages lies in the fact that from the beginning of the movement, and in forward movement as well as in the backward movement of the leg, the fin assumes a position that is more favorable for propulsion, which therefore develops more rapidly and is further improved by the fact that the negative zone is greatly reduced.

Another advantage obtained proceeds from the fact that the inclination of the fin with respect to the sole of the slipper places said fin in a position parallel or roughly parallel to the axis of the leg, before the beginning of the forward movement of the leg, as is shown by Figure 9, this position making it possible to improve the effectiveness of this movement.

Furthermore, due to the absence of central connection between the fin and the front end of the slipper, said fin can adopt, during kicking of the legs, a gutter-shaped transverse profile with increased concavity, which makes it possible to channel a large volume of water in the direction of the trailing edge of the flipper, the lateral leakage being in effect greatly reduced, which is another reason for improvement of the performance or propulsive effect of said flipper.

Finally, due to the above-mentioned characteristics of the swim flipper according to the invention, the user can glide in a better swimming position; one moreover obtains a reduced resistance to the movements of leg kicking which is therefore less fatiguing, and although it seems paradoxical, this reduction of the resistance does not in any way lessen the hydrodynamic performance of said flipper, which is in effect superior to that of the traditional flippers.

The aims, characteristics and advantages mentioned above, and yet others, will emerge more clearly from the following description and from the appended drawings in which:

Figure 1 is a top view of the swim flipper according to the invention.

Figure 2 is a bottom view.

Figure 3 is a view on a larger scale and in cross section following line 3-3 of Figure 1.

Figure 4 is a view on a larger scale and in cross section following line 4-4 of Figure 1.

Figure 5 is a view on a larger scale and in cross section following line 5-5 of Figure 1.

Figure 6 is a side view of this swim flipper.

Figure 7 is a longitudinal section following line 7-7 of Figure 1.

Figure 8 is a side view illustrating the curvature of the fin of the flipper during forward movement of the leg; the broken line representing the position of said fin at rest.

Figure 9 is a diagrammatic view showing the efficient position of the fin of the flipper according to the invention, at the beginning of the forward movement of the leg, and during this movement.

Figure 10 is a diagrammatic view showing, comparatively, the less effective position of a traditional flipper at the beginning of the forward movement of the leg and during this movement.

Figure 11 is a cross section showing the greater concave conformation of the fin according to the invention when the latter is in action, the broken line illustrating the flat conformation of said fin at rest.

Figure 12 is a cross section illustrating, comparatively, the flat conformation of the fin of a conventional flipper, which remains identical or roughly identical whether the fin is at rest or in action.

Reference is made to said drawings in order to describe an advantageous, although non-limiting, embodiment of the swim flipper according to the invention.

This flipper is executed out of any suitable supple or flexible materials such as rubber, synthetic elastomer or other plastic material, etc., or out of a combination of these materials or any other suitable materials.

In a known manner, it has well fitting foot pocket or slipper 1 and fin 2 extending beyond the end of said slipper and ending with trailing edge 3. The fin mainly consists of web foot or central propelling surface 2a, whose width increases in the direction of the

trailing edge and that is delimited by two lateral rims or ribs 2b connected at the opposite sides of the slipper.

According to a first characteristic of the invention, the flipper has, in front of slipper 1, slot 4 partially separating it from fin 2. This slot advantageously has the shape of a curved notch whose concavity is oriented in the direction of the slipper. It preferably extends from one edge to the other of web foot 2a, bordering and going around front end 1a of the slipper. In this way, fin 2 is attached to slipper 1 only by lateral ribs 2b, which must therefore be very strong at the start of said slipper in order to take into account the lack of connection between the sole of the slipper and the start or upstream edge of web foot 2a.

Advantageously, the lower side of web foot 2a has median rib 2c extending from the edge of curved slot 4 to trailing edge 3.

According to another advantageous characteristic of the invention, fin 2 forms a negative dihedral angle β with respect to plane P-P that includes sole 1b of slipper 1.

This negative dihedral angle is preferably 30° or on the order of 30°, so that the fin occupies an advantageous position parallel or roughly parallel to the axis of the leg at the start of the first kicking period, as shown by Figure 9. In other words, the lower surfaces of the sole of the slipper and of the fin form, between them, an angle Δ of 150° or on the order of 150° (Figure 8).

Thanks to notch 4 and to the inclination of fin 2, the latter can assume a curvature that is favorable for the propulsive effect or performance of the flipper, from the beginning of the movement of the leg, during the forward movement (Figures 8 and 9) as well as during the backward movement. Propelling surface 2a of the fin has a relatively reduced uniform thickness over its whole length, with the exception of its initial or upstream portion 2a' bordering curved slot 4, which is slightly thicker in order to reinforce its tear strength. This configuration and the presence of said notch allow the fin to assume a gutter-shaped concave transverse profile that ensures better channeling of the stream of displaced water, which is directed towards the center of said fin following arrows f of Figure 11, and whose propulsive effect is thus optimal because of the insignificance of the lateral leakage.

Also emphasized is the fact that median rib 2c also contributes to the formation of the concave transverse profile of the fin, during kicking of the legs.

Claims

1. A swim flipper comprising a slipper (1) and fin (2) that has central propelling surface (2a) and two lateral ribs (2b), characterized by the fact that it has, in front of said slipper (1), slot (4) partially separating the slipper from said fin.

2. A swim flipper according to Claim 1, characterized by the fact that said slot is in the form of a curved notch.

3. A swim flipper according to Claim 2, characterized by the fact that the concavity of this notch (4) is oriented in the direction of front end (1a) of slipper (1) of said flipper.

4. A swim flipper according to Claim 3, characterized by the fact that notch (4) borders and surrounds front end (1a) of slipper (1) of said flipper.

5. A swim flipper according to any one of Claims 1 to 4, characterized by the fact that slot (4) extends from one edge to the other of propelling surface (2a) of fin (2), which is attached to slipper (1) by lateral ribs (2b) only.

6. A swim flipper according to any one of Claims 1 to 5, characterized by the fact that propulsive surface (2a) of fin (2) is provided, at least on its lower surface, with central rib (2c) extending from the edge of slot (4) to trailing edge (3) of said fin.

7. A swim flipper according to any one of Claims 1 to 6, characterized by the fact that propulsive surface (2a) has a relatively reduced uniform thickness over its whole length, with the exception of its initial or upstream portion (2a') bordering slot (4), which is slightly thicker.

8. A swim flipper according to any one of Claims 1 to 7, characterized by the fact that fin (2) of said flipper forms a negative dihedral angle (β) with respect to plane (P-P) that includes sole (1b) of slipper (1).

9. A swim flipper according to Claim 8, characterized by the fact that the value of this negative dihedral angle is 30° or on the order of 30°.

10. A swim flipper according to any one of Claims 1 to 7, characterized by the fact that fin (2) of said flipper forms a dihedral angle (Δ) on the order of 150° with respect to sole (1b) of slipper (1).

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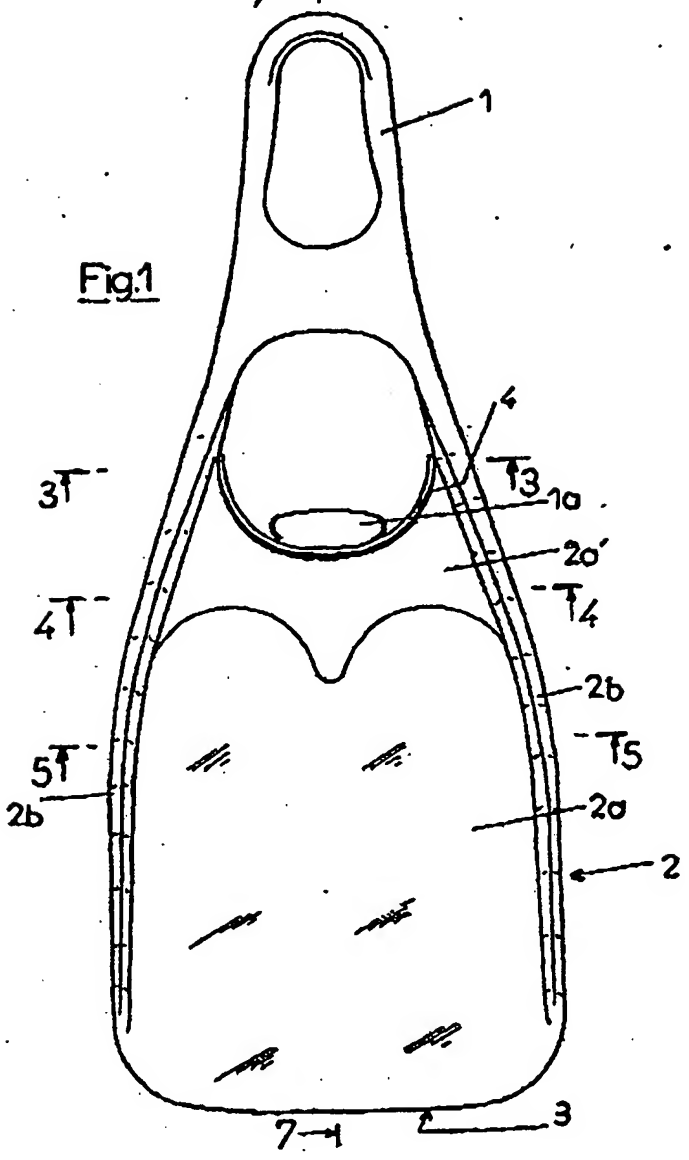
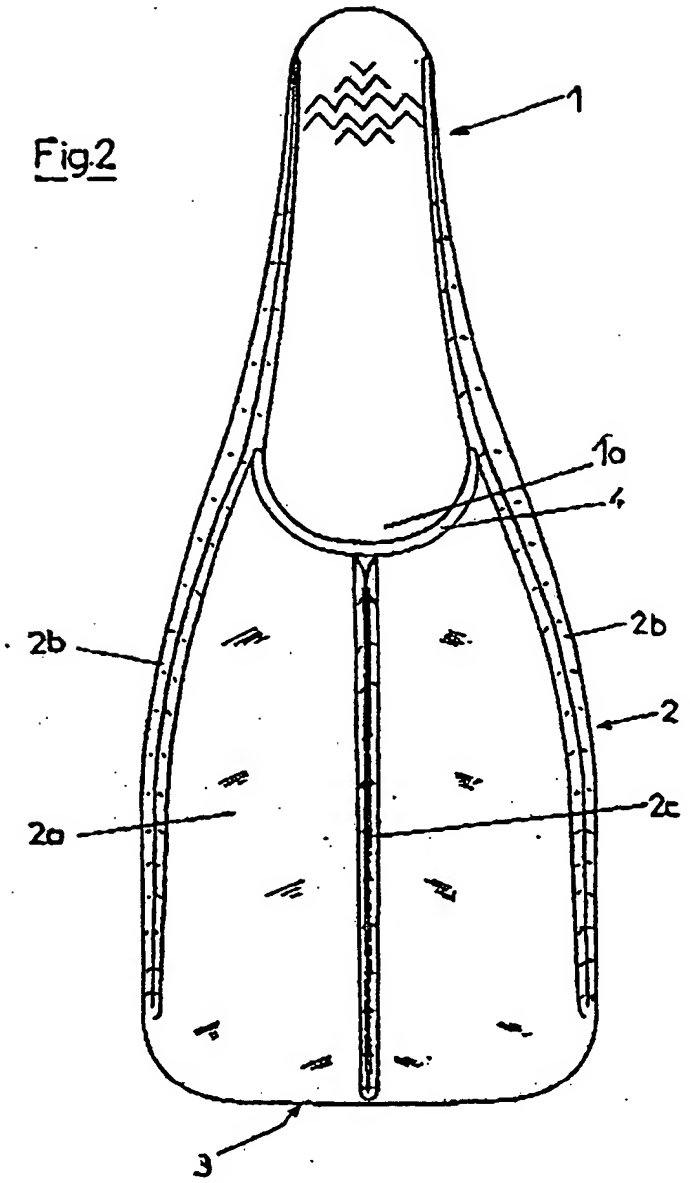


Fig.1

Fig.2



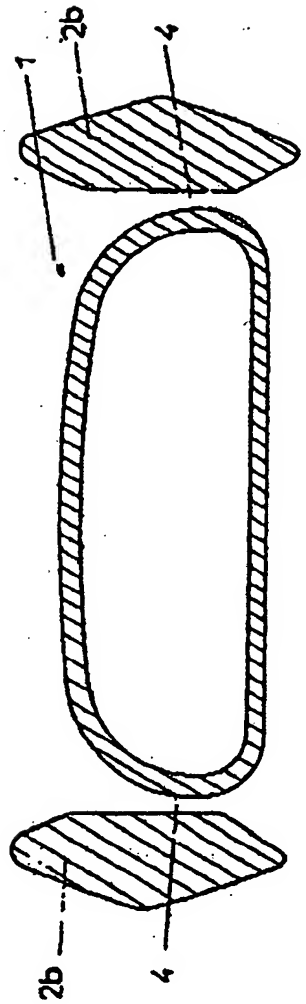


Fig.3

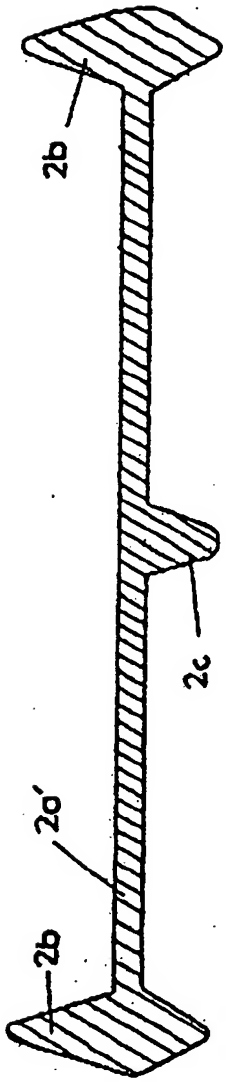


Fig.4

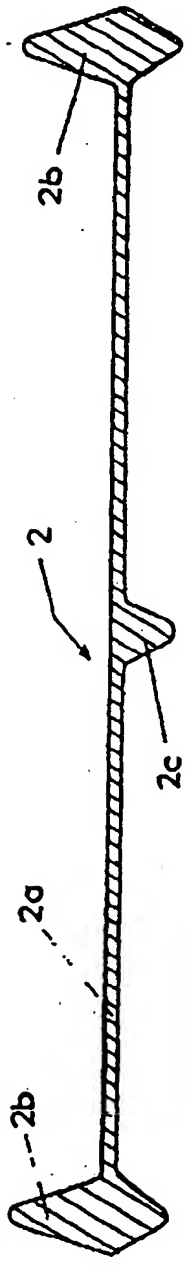


Fig.5

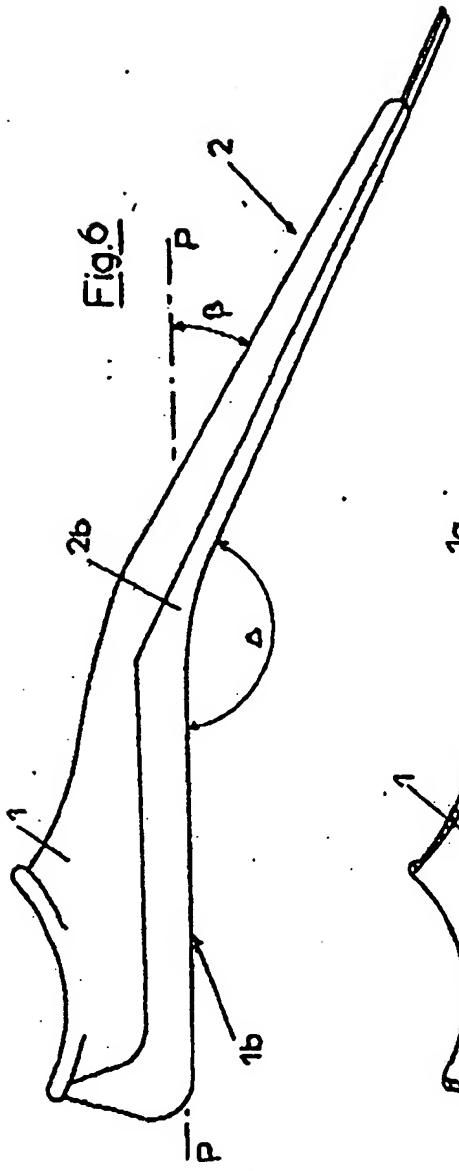


Fig.6

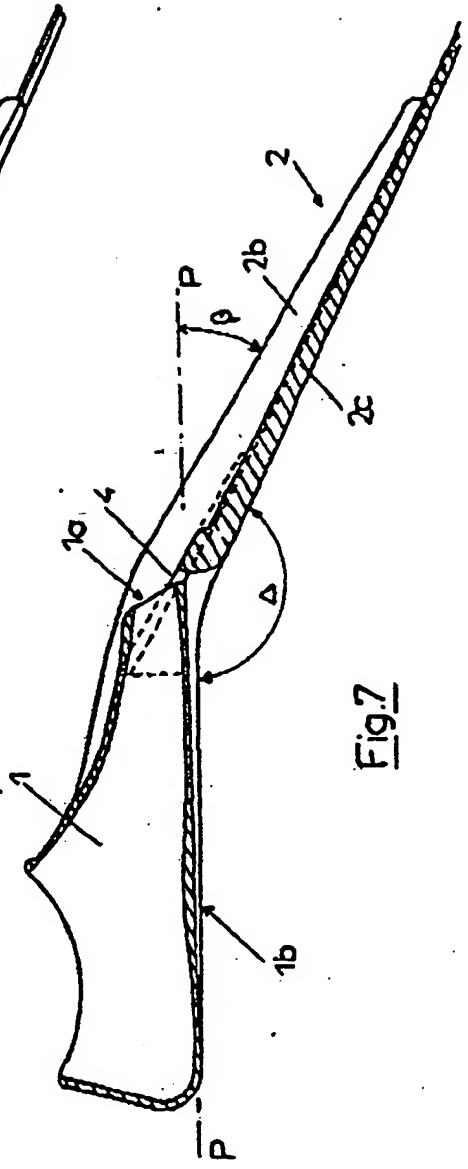


Fig.7

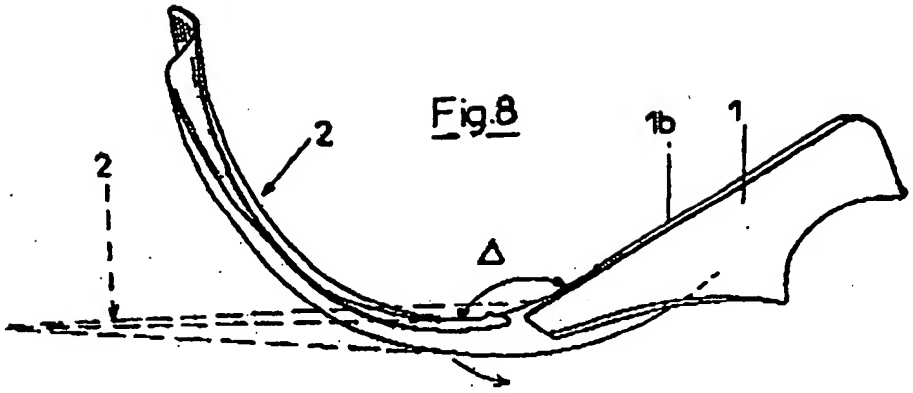


Fig.8

Fig.9

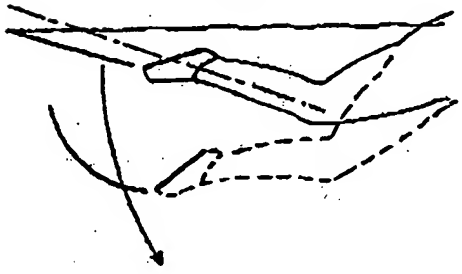
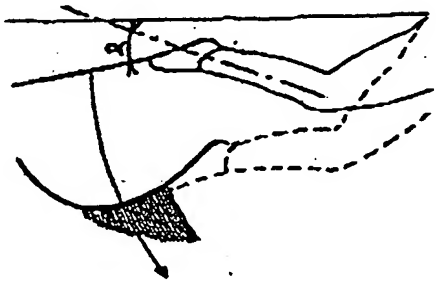


Fig.10



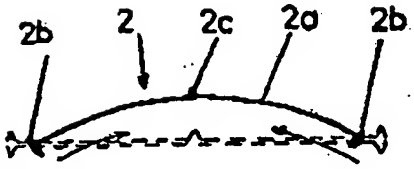


Fig.11

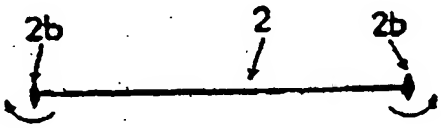


Fig.12

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We certify that the attached English translation conforms essentially to the original French language.

K Vitray

Kim Vitray
Operations Manager

Subscribed and sworn to before me this 5 day of FEBRUARY, 2002.

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